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NOTES ON THE GENUS *POLORTHUS*, Gabb.

BY WILLIAM M. GABB.

IN 1834, Dr. S. G. Morton, in his "Synopsis of the Organic Remains of the Cretaceous Group of the United States," described a species under the name of *Teredo tibialis*; mentioning a former edition of the same work, when he says he "referred this species to *T. antenautæ*, Sby." (*Min. Conch.*, vol. i. p. 231, pl. 102). Sowerby's shell is from the London clay, and Morton was correct in separating the American species, which is Cretaceous. But while correcting one error he fell into two others, not less grave. He included all of the terediform tubes found in New Jersey under the one name, and figured as the type of the species a shell which I believe is not only not a *Teredo*, but is *Cephalopod*. There are at least two species mentioned by Morton (*Syn. Cret.*, p. 69); and for the one figured and described, the specific name must be retained. For the other I proposed the name of *T. irregularis* in 1860 (*Jour. Philad. Acad.*, 2d ser. vol. iv. p. 393, pl. 68, fig. 19).

In 1861, while examining Dr. Morton's specimens, I was struck by some peculiarities in the tubes, which, on further study, induced me to propose the above generic name, and suggest the relationship of the genus to *Vermetus*. Since then the matter seems to have been forgotten, until recently my friend, Dr. Stoliczka, in his able work on the Fossils of India (*Pal. Indica*, vol. iii. p. 14), quotes the name doubtfully and at second hand for the Smithsonian Check List, and in the *Pholadidæ*. This last fact has determined me to call attention to the genus in a more explicit manner than the original imperfect notice, in the Proceedings of the Academy, 1861, p. 366.

*P. tibialis*, Morton, is the species for which the name was first proposed. At the time I described the genus, I was in receipt of a fine series of specimens of my *Gastrochæna Americana*, from the "Ripley Group" of Tennessee, sent me by Prof. Safford, the State Geologist, and I found that the two forms were congeneric, although I have never yet seen the apex of the latter species.

The generic characters are as follows: Shell tubular, growing singly or in clusters, nearly straight. Interior divided into chambers by two entirely different sets of septa. In the young state,

the septa are cup-shaped, as in *Orthoceras*, but, unlike that genus, they are not perforated by a small siphonal opening. Instead, the middle of each septum is prolonged into a tapering tube with an elliptical cross section, the apex of which tube enters the base and nearly, or completely, fills the interior of its predecessor. Extreme apex unknown. In the space immediately succeeding the last septum, there is a saddle-shaped, continuous muscular (?) scar, which rises on the sides corresponding with the broad part of the funnel-like siphonal tubes, and is deeply depressed on the sides corresponding with the ends of the ellipse. Beyond this stage, the shell continues as a nearly straight tube, increasing very slowly in diameter and, at irregular intervals, is hermetically closed by convex septa, having their convex face reversed; that is to say, placed towards the broader, or newer portion of the tube. The structure is microscopically prismatic, the prisms being placed transversely as in *Inoceramus*. Both the walls and the septa are made up of numerous layers of shell substance, no structural difference existing between the several parts.

*P. tibialis* grows in masses of tubes bearing a strong superficial resemblance to *Teredo*, which resemblance misled Dr. Morton in his generic reference. But, even apart from its internal structure, the analogy fails, since it never occurs perforating wood or other hard substances. The spaces between the shells are filled only with sand. This free mode of growth, and my not being acquainted at the time with the peculiar characters of the apical portion, induced me to refer my genus to the *Vermetidæ* on account of the septa in the larger portions of the tube; a character not unlike that of *Vermetus* and *Cæcum*. Latterly, through the kindness of my friend, Dr. Joseph Leidy, I have been enabled to study better specimens than any heretofore examined, and thus discovered the anomalous character of the young shell.

*P. Americanus* seems to be solitary in its habits; at least, no masses of this species have ever been obtained. In external form it is not unlike the tube of *Gastrochæna*, and I thus described it at first. The Tennessee specimens, preserved in a soft matrix, show that internally it has the same imperforate septa, convex towards the broader end of the tube, and placed at irregular distances.

The structure of the young shell places this genus, as the type of a new family, POLORTHIDÆ, among the *Cephalopods*, and it only

remains to determine what are its nearest relations. Its simple-edged septa confine it to the group, of which the modern *Nautilus* may be taken as a type. But the complex nature of its septa has no analogy among the modern genera, even geologically speaking. We must look for its relations among the palæozoic forms, such as *Endoceras*, *Actinoceras*, and more especially *Beatricea*. In fact, it seems in some respects to be intermediate between the last, as described by Hyatt<sup>1</sup> and the two former; and again to connect both groups with the *Orthoceridæ* proper. In *Orthoceras* we have direct communication from one chamber to the next. In *Endoceras*, *Actinoceras*, and the allied genera, the position of the siphon is occupied by a shelly tube which seems to have allowed no such communication beyond its own walls. In *Beatricea* the central column is described as consisting of a chain of small hollow chambers, not continuous either with each other or with the encircling chambers. In *Polorthus*, unlike *Orthoceras*, the tubes are not membranous, but shelly. They can be compared in their enveloping character to the column of *Beatricea*, of which Hyatt says, "the central chambers are imperforate, generally deeply concave, and set upon one another like a pile of Chinese teacups." By elongating these "teacups" into a series of laterally compressed cones, we have the column of *Polorthus*, with the difference that in the latter each cone is soldered to, or more properly, is a continuation of one of the outer septa. The nature of the matrix is such that I have not been able to demonstrate, beyond a doubt, the character of the apex of these cones, but I believe it to have been perforated by a minute slit; a fact which would connect *Beatricea* with *Endoceras*. On the other hand, while the base of each cone, where it leaves the transverse septum, is *apparently* closed completely by the next cone fitting tightly into it; there is at least a rudimentary, if not a real connection between the outer chamber and the interior of the column, thus showing a nearer connection between *Polorthus* and *Orthoceras* than between the latter and the other two quoted genera.

The muscular scar visible on the casts of the interior just above the last of the septa is not without its analogy. I have found such impressions in all the modern species of *Nautilus*, but more especially in *N. pompilius*,<sup>2</sup> where it consists of two broad scars

<sup>1</sup> Amer. Jour. Sci., 1865, p. 261.

<sup>2</sup> See Waagen, Ueber die Ansatzstelle der Haftmuskeln beim Nautilus

like those of an oyster, connected by a faint polished line, marking the mantle margin.

Having pointed out what I believe to be the relations of this remarkable fossil, it yet remains for me to remark on the anomalous circumstances connected with the manner of growth of the shell in its later stages.

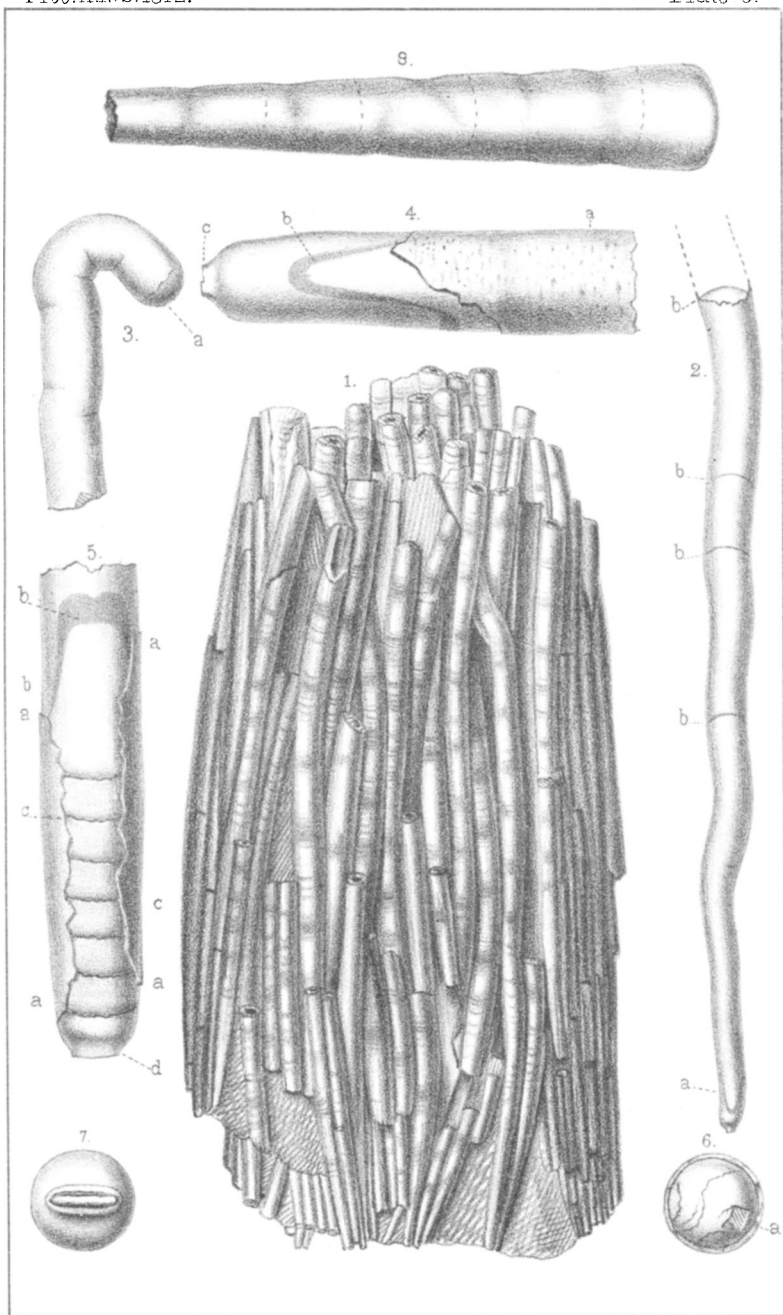
After growing to a length of nearly an inch, the animals (at least of *P. tibialis*) seem to have congregated into colonies. Thenceforward the septate character, above described, ceases. The tube increases gradually in diameter as it grows in length, and at distances varying without any determinate system, from a quarter of an inch to two inches apart, the tube is hermetically closed by arched septa, with their convex faces *towards* the mouth of the tube; or in a reversed position to that of the primary series. The tube consequently could have been of no further use as a float, like that of the other chambered cephalopods, and would have been really disadvantageous to its occupant, was it not permanently anchored as we see it actually was. The colonies must consequently have resembled a highly magnified view of a bryozoon or a coral.

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#### EXPLANATION OF PLATE 8.

Fig. 1. View of a mass of *P. tibialis*, natural size.

- “ 2. One tube, slightly magnified : *a*, muscular scar ; *b*, secondary septa.
- “ 3. An unusually large tube, abnormally bent, natural size : *a*, one of the secondary septa.
- “ 4. Magnified view of end of a tube : *a*, surface markings of the species (*P. tibialis*) ; *b*, end view of muscular scar on the cast ; *c*, internal cast of the last chamber and part of the mould of the central tube.
- “ 5. Side view of the end of another specimen : *a, a*, parts of the shell ; *b, b'*, muscular scar, *b* seems to correspond with the broad muscle of Nautilus ; *c, c*, primary septa ; *d*, side view corresponding with *c*, fig. 4.
- “ 6. Top view of a secondary septum broken through at *a*.
- “ 7. End view of one of the primary septa.
- “ 8. *P. Americanus*, natural size.



Gabb on Polorthus.